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CASE REPORT

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Endovascular treatment of nutcracker syndrome – a case report

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Summary

Background: The „nutcracker" syndrome is most commonly caused by arterial compression of the left renal vein between the superior mesenteric artery and the aorta. As a consequence venous blood pressure increases within the renal pelvis, ureter and gonadal veins.

This compression syndrome may be treated by endovascular stent implantation into the left renal vein.

Case report: A 20 year old female patient was referred to us, suffering from pain in her left side, gross proteinuria and the suspicion of "nutcracker" syndrome. Symptoms were present for the last 3 years. Angio MRI was performed and confirmed compression of the left renal vein between the aorta and the superior mesenteric artery. The patient was qualified for endovascular treatment. A self expandable metallic stent, diameter 16 x 40 mm was implanted into the left renal vein. Control venography confirmed good placement of the stent and a good immediate hemodynamic effect of the procedure. The patient remains symptom free in a 14 month follow up period.

Conclusions: At present, endovascular stenting seems to be the method of choice for the treatment of the nutcracker syndrome.

Key words: nutcracker syndrome • renal vein compression • vein stenting • venous stents

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Background

Nutcracker syndrome is usually a result of the left renal vein compression between the superior mesenteric artery and the aorta. It may lead to distension of the venous system in the renal pelvis, calyces and gonads. The syndrome is manifested by pains in the left lumbar region and the abdomen. Hematuria, proteinuria, varicocele in men and dysmenorrhea in women may also occur [1, 2].

It is not easy to diagnose nutcracker syndrome. Patients with the aforementioned nonspecific symptoms are usually consulted and diagnosed for a long time. Establishing correct diagnosis is possible on the basis of imaging modalities, such as Doppler sonography and angio-CT [3].

One of the methods of treatment of nutcracker syndrome (apart from more commonly used surgical methods) is endovascular stent implantation into the left renal vein. Such a procedure was first performed by Neste in 1996 and ended with success [4].

In the paper we present our experience in endovascular treatment of a 20-year-old female with symptomatic hematuria and proteinuria, diagnosed with nutcracker syndrome.

Case report

A 20-year-old female patient was referred to the Department of General, Vascular and Transplant Surgery

of the Medical University of Warsaw because of persistent isolated proteinuria, pain in the left flank and suspicion of nutcracker syndrome. The symptoms of moderate severity had persisted for 3 years. Physical examination revealed no abnormalities. Blood pressure was within normal limits recommended by the WHO. Laboratory tests revealed proteinuria of ca. 0.45 g/day. Positive results of orthostatic test (significant difference in proteinuria between day and night – 1.07g/12h vs. 0.07g/12h) indicated the presence of symptomatic nutcracker syndrome.

Imaging modalities were applied to confirm the diagnosis. USG visualized a stenosis of the left renal vein to 2.1 mm, located above the aorta (Fig. 1). Angio-MR confirmed unequivocally a significant stenosis of the left renal vein at the site where it passed between the aorta and the superior mesenteric artery. Contrast enhancement of both kidneys was normal. Renal vein stenosis was also confirmed by angio-CT, which included preliminary measurements of the left renal artery (Fig. 2). The patient was qualified for renal vein angioplasty with an expandable vascular stent. After venography performed with the use of a calibrated catheter, which confirmed left renal vein stenosis over the aorta, from the approach through the right femoral vein, a vascular stent of 16 x 40 mm dimensions (Wallstent, Boston Scientific Corp.) was placed in the left renal vein (Fig. 3 and 4).

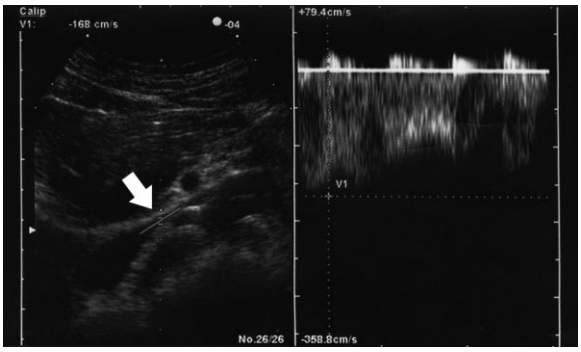

Figure 1. Diagnostic Doppler sonography. Left renal vein stenosis between the aorta and the mesenteric artery accompanied by increased renal venous flow velocity beyond the obstruction site.

Control venography demonstrated a good early hemodynamic effect of the procedure. The patient was immobilized for 24 hours postoperatively, with Plavix 1 x 75 mg for 30 days and acetylsalicylic acid 1 x 150 mg chronically instituted. Control Doppler sonography performed 3 days after the procedure demonstrated that the stent had not expanded to its full diameter yet in the peripheral segment

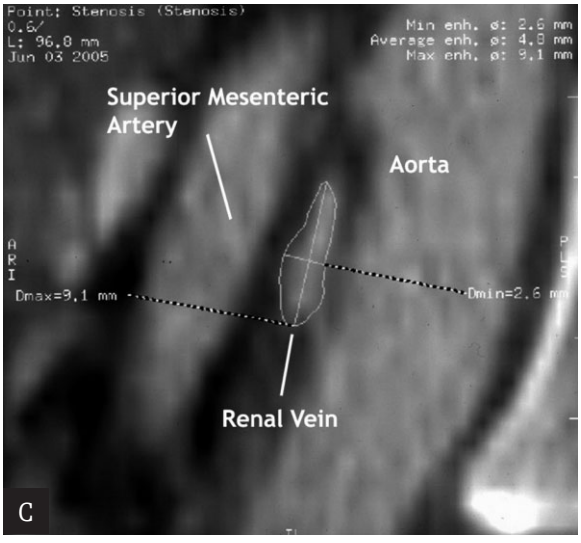

Figure 2. Angio-CT of the renal arteries and veins – 16-row CT. **A**. The axial layer at the renal venous level – compression of the left renal vein visible. **B**. Multiplanar reconstruction – cross-section of the left renal vein above the stenosis site. **C**. Multiplanar reconstruction – cross-section of the left renal vein at the stenosis site (SMA – superior mesenteric artery, A – aorta, RV – renal vein). **D**. Reconstruction – measurements of the degree of stenosis of the left renal vein.

of the renal vein, but the venous outflow of blood from the kidney, as well as inferior vena caval flow, was unobstructed. There was no renal vein distension in the vicinity of the renal hilus, which had been observed previously (Fig. 5).

The patient was discharged from the hospital 4 days after the procedure without any abnormalities in the basic examinations and urinalysis. She has remained asymptomatic in 14-month follow-up. Urinalysis results show no abnormalities, without any signs of proteinuria or hematuria.

Discussion

Nutcracker syndrome can be diagnosed only after exclusion of all other known causes of hematuria and proteinuria. Examinations enabling the diagnosis are based on many diagnostic methods, among which Doppler sonography and angio-MR options are of particular value. However, the diagnosis can be established unequivocally only by elective venography of the left renal vein and the inferior vena cava [3].

Nutcracker syndrome may occur in two variants, anterior nutcracker syndrome and posterior nutcracker syndrome. Anterior nutcracker syndrome results from compression of the left renal vein between the superior mesenteric artery and the aorta, whereas the posterior syndrome involves hypertension in the left renal vein situated behind the aorta, due to vein compression by the aorta and the spinal column [5].

Various methods of treatment of this syndrome have been proposed to date. In case of disorders manifested only by sporadic left flank pains and microscopic hematuria, the method of choice is long-term observation and close nephrological surveillance [6]. On the other hand, severe and persistent painful symptoms, as well as marked hematuria, provide indications for surgical or endovascular intervention. The intervention methods include left kidney autotransplantation, new venous anastomosis of the left kidney to the inferior vena cava, and endovascular stenting of the left renal vein [7, 8].

According to some authors, autotransplantation of the kidney is the method of choice in treatment of anterior nutcracker syndrome [5, 9].

On the other hand, endovascular treatment gives good results in the management of venous compression syndromes such as May-Thurner syndrome (compression of the left iliac vein by the common iliac artery). For this reason, Neste performed in 1996 the first procedure of stent

Figure 3. Venography of the left renal vein using a calibrated catheter – narrowing above the drainage site to inferior vena cava visible, collateral flow in the paraspinal plexuses.

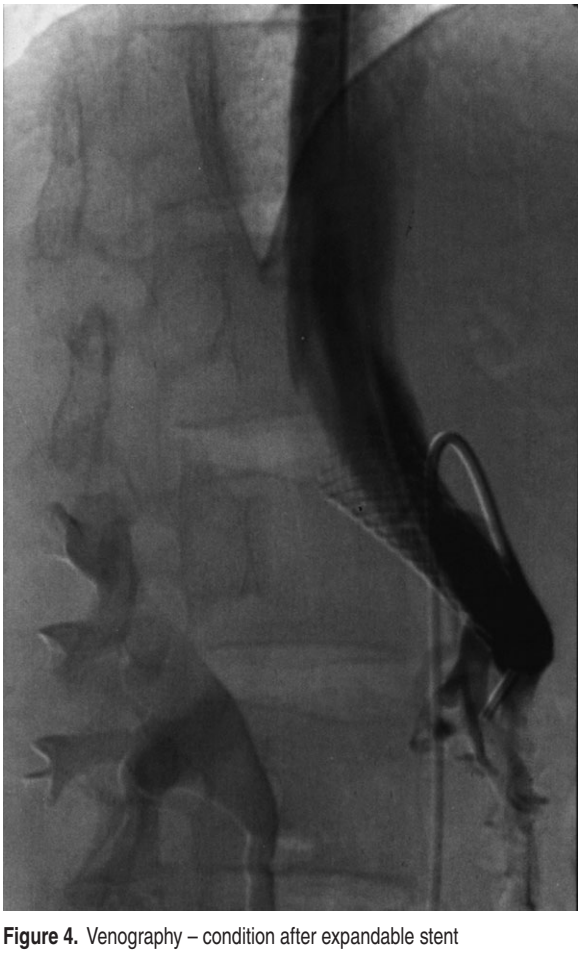

Figure 4. Venography – condition after expandable stent (WALLSTENT) implantation into the left renal vein. Free venous drainage to VCI, without collateral flow.

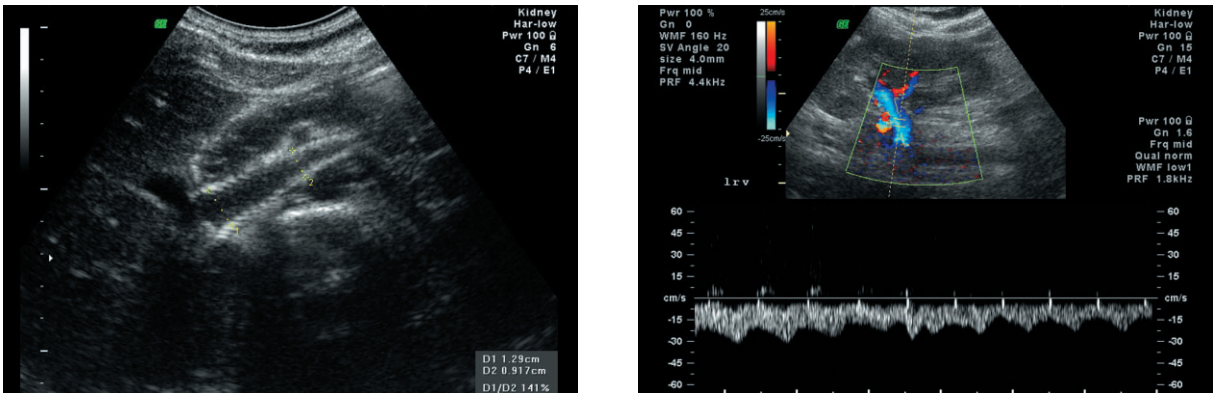

Figure 5. Control postoperative USG – an expanded stent in the left renal vein. In Doppler sonography water outflow through the left renal vein visible.

placement in the left renal vein because of nutcracker syndrome [4]. In contrast to other surgical treatment methods, endovascular treatment allows to avoid extensive abdominal surgery and associated complications. The implanted stent has mesh structure and therefore undergoes rapid endothelization after placement, which reduces the risk of thromboembolism.

Ensuring free blood outflow without pressure gradient also prevents distant thromboembolic complications. Although the observations concerning distant results of renal vein stenting applied as the treatment of nutcracker syndrome have been scarce in the available literature, the observations of distant stent patency in other venous systems (hepatic veins and the portal system in case of TIPPS anastomoses, as well as in venous pathologies of liver grafts) indicate that it is possible to use this method also in hepatic vein obstruction syndrome [10]. In conclusion, endovascular treatment of nutcracker syndrome seems currently to be the method of choice.

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